



Ø BEAT



COLO. SPRINGS,
COLORADO

AUGUST 1981

Tune It With A Stub

HOMEBREW ¼ WAVE MAG MOUNT

Enclosed are the details of the ¼ wave, magnetic antenna, that has been matched to 50 Ohms Z, which I was telling you about.

The only critical area, is the preparation of the Coaxial Stub. Use RG-58C/U cable only — foam type cables are not desirable, as the inner dielectric melts at too low a temperature, and causes undue problems. The cable should be new, so as no oxides have formed on the metals. Use ERSIN Multi-Core solders, as they have the best flux for this job.

Start by removing about an inch of outer jacket, and without disturbing the braid, quickly tin the braid, with a 50 to 75 watt iron. I run four beads of solder down the braid, first. Then, pick up the cable, hold the end down, melt the solder around the cable, beginning at the jacket, and allowing the solder to flow downwards. When you get to the end of the cable, quickly flip it against the bench to remove excess solder. Allow the cable to thoroughly cool (15—20 minutes) before further handling. This prevents cable distortion, a critical factor. Prepare each end of the cable in a similar manner.

When the cable has completely cooled, take a tubing cutter, and *score, lightly*, the tinned braid, about ¼ inch from the end, then with a knife, whose blade has been sharpened to a wire edge, with a file, carefully slit the braid, from the score point to the end. Place both thumb nails at the score point and gently flex the cable. The braid will break cleanly at the score point, and the excess can be easily removed. On the shorted end, the inner dielectric can be cut flush with the braid. On the open end, allow ¼ inch dielect to protrude. Tin the inner conductor; on the short end, fold it over and solder to the braid. The stub length is measured from the end of the braid to the end of the braid.

The drawing shows a BNC connector on the cup; USE IT. Not only are they a uniform impedance connector, but they are very water resistant, when properly assembled.

When you have finished assembling the antenna, seal all the openings with Silicone Rubber. You don't want any moisture inside.

If you have followed these instructions closely your antenna will have a V.S.W.R. of 1.2 to 1 or less using a BIRD watt meter. This is across the full 4 MHz. *If for some reason it does not, you have probably goofed the Stub in some way.* Probably got it hot. To accurately measure the V.S.W.R., use a three-half-wavelength cable, (Electrical) to the watt meter, and place the antenna in the middle of the car roof, or hood. Many ham type SWR bridges do not have a sufficiently low residual VSWR to measure this antenna.

Good luck and happy mobiling.

(continued on page 5) 73's, Smitty, WBØLTV

From CCARC Minutes . . .

AGØZ: The City of Longmont is the most recent to act against the interests of amateurs. Their City Council feels no Building, or Structure in Longmont should be over 35' high. A "Building" defined as "where something lives" and a "structure" "occupies land".

What had been done so far to resolve the problem was reported. Would seem the City Council acted against their own ordinances.

WØENO: Here in Longmont the Club is starting a Longmont Tower Fund. Any publicity you can give this will be appreciated.

P.P.R.A.A. DIRECTORS

PRESIDENT	Dave Vierling NØDV 2511 N. Tejon 80907	473-0293
V. PRESIDENT	*Les Borst WDØGTA 2542 E. Bijou 80909	634-3995
SECRETARY	*Bill Allen KFØW 1341 Doyle Pl. 80915	597-3321
TREASURER	*Doug Moloney WBØMHP 3817 Vaquero Cir. So. 80918	599-9601
Board Member	Ray Uberecken AAØL 9635 Thoroughbred 80908	495-3544
Board Member	Don Lohse KBØKQ 1410 E. LaSalle 80907	635-7469
Board Member	Charleen Colvin WBØYOB 4610 Topaz 80918	598-7704
Board Member	*Al Bailey ADØZ 2715 Alteza Ln. 80917	597-8514

(* Two-year board terms began October 1980)

ZERO BEAT is published monthly in the interest of the members of the Pikes Peak Radio Amateur Association, Inc., Colorado Springs, Colorado. Permission is given to reprint articles or excerpts provided credit is given. Deadline for submission of articles is the 21st of the month. Classifieds accepted anytime.

The Pikes Peak Radio Amateur Association meets on the second Wednesday of every month at the First United Methodist Church, 420 N. Nevada, at 7:30 p.m. All amateurs and interested parties are invited to attend.

Editor: Don Lohse KBØKQ, 1410 E. LaSalle, Colorado Springs, CO 80907 635-7469

JULY MEETING MINUTES

The July meeting of the PPRAA was called to order by President Dave Vierling at 7:40. Members introduced themselves, followed by the Treasurer's report by Doug WBØMHP, with \$1816.93 in the treasury. Dave NØDV reported that he and Don WDØBSZ are looking into the church as a possible permanent meeting place.

Greg KAØFOZ, the new chairman of the Interference Committee, gave a short report on activities of the committee, and asked that any QRM problems with neighbors be sent to him. His number is 597-4351. Speaking of Committee Chairmen, they are still needed in two vital areas—education and public relations. If you have an interest in either or would just like to help—get a hold of one of the board members please.

Don KBØKQ gave a Zero Beat report, and again asked that any articles for Zero Beat be gotten to him. Kudos were given to those who have written for Zero Beat, their efforts are appreciated.

The July 4th torch lighting ceremony public service event was covered by WBØYOB, WBØMHP, WDØGTA, WØTGL, KØDJ, WAØYTK, NØAVY and WBØPAJ. It was reported on by Frank PAJ, who detailed some problems encountered and solutions achieved.

The discussion of public service events, and the problems accompanying them, led to Doug WBØMHP, Smitty WBØLTV and Les WDØGTA volunteering to put together some 2 meter antennas for club use.

WBØLTV brought up the problem of getting someone to make a phone call for you (in an emergency) on the local repeaters. Discussion followed.

Smitty also reported that the club has secured the use of the Black Forest Recreation Area for our club picnic on Sunday, September 13, from 10 a.m. to 6 p.m. Possible activities were discussed. The site is on Shoup Rd. in the Black Forest, a couple of miles west of Black Forest Rd.

A successful FD was described by Dave NØDV, even though we had to move our location due to the US Army. Seems that they got there first (even though they were in the wrong place!), so we moved up the road a bit. Oscar contacts, lots of VHF, new antennas, QRP, solar power, plus the usual CW and SSB all contributed to the good time.

Oak KØROL, announced that TRW is willing to donate some scrap aluminum to the club. The offer was accepted with speed, (remember Homebrew Night in December) and thanks. Oak also noted that the 4th quarter CCARC meeting will probably be in Colorado Springs.

Following break, Ray AAØL gave an excellent presentation on SWR and other such mysteries. With the use of an HP computer and graphics terminal, we were all able to see what goes on inside the coax. Time proved far too short for the program, and Ray said he would continue it again at a later date.

The meeting was adjourned at 9:59.

Respectfully submitted,
KBØKQ (for KFØW)

FOR SALE—HW 101, new finals, PS 23. New Shure 444D mic, HM 102 SWR/Watt meter, \$495 package only. Ed Mitchell NØAKT 488-3727 (Monument).

Typesetting courtesy The Letter Setters

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PRINTED CIRCUIT BOARDS

A good printed circuit board starts with good board material.

The best board material is Glass Epoxy. There are two grades of this material that hams should be interested in:

1. G-10 — base grade of glass epoxy good for use in Ham Radio.
2. FR-4 — Heat resistant glass epoxy excellent for use in Ham Radio.

Standard thicknesses of the board material are .059" to .063 inches, or approx. 1/16". The standard type of laminate is 1 oz. copper. That means there is 1 oz. of copper for every square foot of board. The thickness of this is about .0015 inches.

The circuit board manufacturing process must start with clean board material.

1. The board should be scrubbed and cleaned of all surface flaws.

2. The board should be degreased.

Care should be taken with prepared board material to prevent fingerprints.

There are 3 popular ways to set a pattern on a circuit board:

1. Direct Mask
 2. Etch Resist Ink
 3. Photosensitive Chemicals
1. Direct Masks are often made from standard masking tape.
 - A. The circuit pattern is either traced or directly drawn on the mask
 - B. The areas to be etched are cut and removed with an exacto knife
 - C. Minor flaws are touched up with an etch resist pen.
 2. In amateur use, etch resist is generally manually applied.
 - A. The circuit pattern is either traced or directly drawn on the copper laminate.
 - B. The areas to be saved are filled in using an etch resist pen.
 3. The photoresist process is used when the first two methods aren't adequate. As a rule of thumb, any complicated circuit pattern should be set using this method.
 - A. The photosensitive solution is applied by either spraying or dipping the board material. In amateur applications aerosol sprays are usually adequate.
 - B. If possible, the solution should be allowed to dry at room temperature overnight. If time does not permit, it can be forced dried by heating the board to about 200 degrees for about 15 minutes.
 - C. Remember — the board is now light sensitive. Store and handle only in subdued light.
 - D. If problems occur, presensitized boards are available.

*** IMPORTANT ***

The type of photoresist solution used is dictated by what kind of image transparency is used — i.e. positive or negative. If a negative is used, both photoresist and developer must be "negative" type, and vice versa.

MAKING TRANSPARENCIES FOR PHOTORESIST IMAGE TRANSFER

Definition: A transparency is "negative" when the foil pattern is clean, and is "positive" when the foil pattern is opaque.

1. If circuit complexity permits, transparencies can be made by placing clear mylar or acetate over a foil pattern picture and darkening in the desired areas with a felt tip pen.
2. Transparencies can also be made using photo sensitive acetate view graph material.
3. When image resolution is critical, the best method is to have a negative (or positive) made at almost any local print shop. The print shop will need a reproducible master and will need to know the scale (i.e. 1X, 2X, 4X, etc.). The cost of such a transparency generally will run \$5 to \$8.

There are two popular methods used by Hams to expose circuit boards:

1. Direct sunlight — the photoresist is ultra-violet sensitive. An ideal source of U/V light is the sun. Place the transparency on top of the sensitized board, cover with clean glass and seal tightly. Keep the assembly covered until you are ready to start the timed exposure. Place the assembly in direct sunlight, uncover and start timing. The length of time required for optimum exposure will depend on time of day and weather conditions, but as a rule of thumb, somewhere between 1 and 1½ minutes is a good range.
2. Artificial Sunlamp — Using a carbon-arc type sunlamp is a good substitute for sunlight. Actually, it is more reliable. It can be used either day or night, and precise exposures can be made with no day to day variations in light conditions. After some experimentation, the optimum intensity and exposure time can be found and used thereafter. As a rule of thumb, a sunlamp placed two feet above the circuit board will take approximately 1½ minutes for optimum exposure.

DEVELOPING

The developer must be the same "positive" or "negative" type as the photoresist and the transparency.

1. Place the exposed circuit board in a tray filled with developer and agitate by slowly rocking the tray back and forth. It will take about 60 seconds for the board to develop fully.

(continued on page 5)

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JULY BOARD MINUTES

The board met at Al Bailey's ADØZ, at 2715 Alteza Lane at 7:30 P.M. on July 13, 1981. Those present were Dave, NØDV; Les, WDØGTA; Doug, WBØMHP; Bill, KFØW; Don, KBØKQ; Al, ADØZ; Ray, AAØL; Bud Liebengood; and Charleen, WBØYOB.

Al Bailey asked about the nonprofit status of the club. Doug reported that it was pending. The club by-laws are to be rewritten by Bill Allen and Don Lohse. Then Doug Moloney, Bill Allen, and Dave Vierling will get together and complete the federal forms.

The need for 2 meter antennas was discussed. The Board voted to allot \$20 to Doug, Les, and Smitty to make soup can antennas which will be added to the club inventory.

The club picnic will be September 13 at the Black Forest Recreation Area. The club will furnish beverages, chips, charcoal grill, and charcoal. Members bring own meat and anything else they want.

The Public Service Committee composed of Doug, WBØMHP; Bob Poirier, KØDJ; Mike Stansberry, KØTER; and Warren Rubin, WBØSJR are ready to coordinate events and assist on technical problems that may exist with that event. Any event that is to be handled by the club should first be approved by the Board then referred to the Public Service Committee.

The following programs were announced: August—Lys Carey, Marshall Quiat, and Carl Smith for an ARRL Q/A period; September—Greg Utterback on interference; October—election of new officers and board members; November—Public Service Committee and December—Home Brew night.

The members working on rewriting the by-laws will also compose a statement of the purpose of the club. The interests of the club need to be polled to be sure the statement is correct.

The August board meeting will be partially devoted to selecting a slate of new officer candidates to be

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published in Ø Beat. If anyone has a likely candidate for office please contact a Board Member.

The Education Committee still needs a chairman. However, Don Lohse will teach novice theory, Dave Vierling will teach code, and Warren Rubin will teach the upgrade classes. It was decided that the classes will start this fall with a novice class, followed by an upgrade class, and a novice class after the upgrade.

Bud Liebengood will be our club representative at the CCARC meeting August 1 in Glenwood Springs. Any suggestions or matters you want brought up at this meeting contact Bud. Oak Stockton, KØROL, will also be attending as vice president of CCARC.

The payment of postage and printing for Ø Beat was approved.

The hammy award recipient was discussed and selected. Have to come to the meeting to find out who the lucky person is.

The September meeting place is still in question. It may be First United Methodist Church, but we do not have confirmation. If you know of any place you would like to suggest let Dave Vierling know.

The next Board meeting will be August 17 at Bill Allen's home at 7:30 P.M.

Respectfully submitted,
Charleen, WBØYOB

THE SOURCE

Look for an ad from a new Zero Beat advertiser next month. The Source, an electronics parts house has opened for business in Colorado Springs. They're at 3524 N. Tejon Suite B, which is behind the old TRW plant. They stock premium grade digital and linear IC's, optical electronics components, and microprocessors, along with the regular part lines. Their phone number is 630-3529. Support all your Zero Beat advertisers!

CIRCUIT BOARDS (cont.)

2. Carefully remove the board from the developer. At this stage, the photoresist is developed *but not hardened*. Any contact to the surface will make smudges and ruin all your hard work.
3. Harden the photo resist by holding the board under slow running luke warm water for two minutes. Remove from the water and stand on edge to dry.

ETCHING

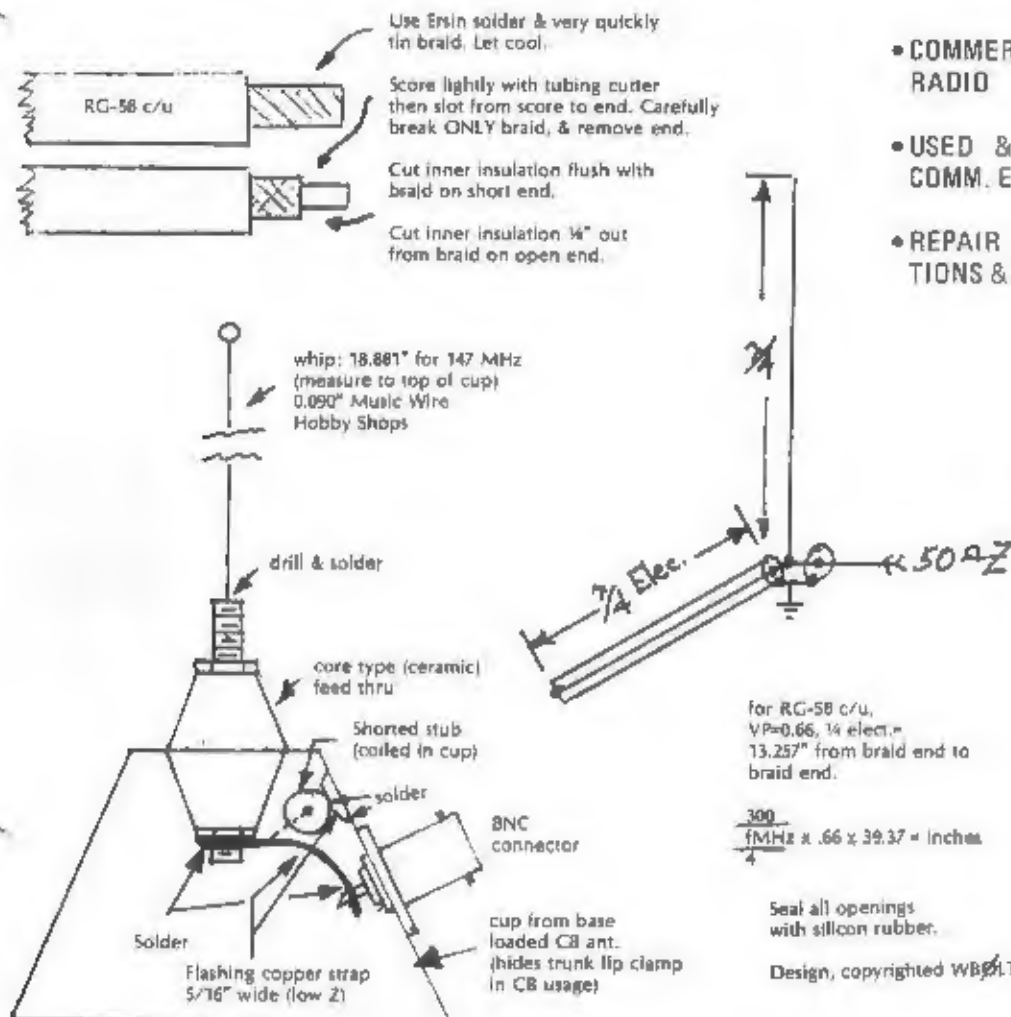
The most abundant circuit board etchant available to Hams is Ferric Chloride.

1. The Ferric Chloride should be placed in a plastic or glass tray. $FeCl_3$ is an etchant, and will etch its way through metal.
2. To reduce etching time, the etchant should be heated to about 120°F. Heating the etchant will easily cut etching time in half. An Infra-red heat lamp placed about one foot above the etch will heat it sufficiently.
3. It is very important that the tray is continuously agitated during the etching process. Improper agitation can easily triple the etching time and ruin the circuit board. Under proper conditions, the board will be fully etched in 30 minutes or less.

DON'T FORGET:

1. Ferric Chloride is an acid
2. Ferric Chloride will stain permanently.
3. Ferric Chloride has a pungent odor.

HOMEBREW (cont.)



LETTERS TO THE EDITOR

Dear Don:

I want to tell ~~Ø~~ BEAT how much I enjoyed Ken Keyte's article, "Radio—A Lifelong Turn On". I, too, have fond memories of the old Ford Spark Coil (and the ability to QRM the entire broadcast band), the UX201A and 199 to be later "modernized" by going full AC powered with the 80 rectifier and the 24 screen grid detector, the 27 amplifier, into a 45 or 47 output. My biggest accomplishment in the very early thirties was to copy the Saturday night reports of Adm. Byrd at the South Pole — direct from Buenos Aires! Like Ken, I got involved in wig-wag and later the Scout Radio Merit badge with my first legal taste of on-the-air operation in 1934.

Vy 73,
Carl L. Smith, WØBW)

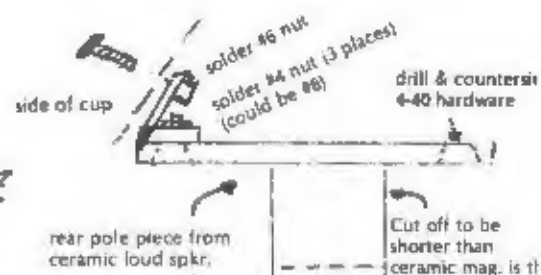
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Boil in old pot, covered, until epoxy breaks down and magnet can be removed from pole pieces without breakage. Propane torch better!

Cover with contact paper, double sticky paper, etc.

MEETING NOTICE

The August meeting of the Pikes Peak Radio Amateur Association will be held on August 12, 1981 at the First United Methodist Church located at the corner of Nevada and Boulder. Lys Carey KØPGM, ARRL Rocky Mountain region Director, Marshall Quiat AGØX, Vice Director, and possibly Carl Smith WØBWJ, ARRL Vice President, will be there to answer any questions or concerns you might have concerning ARRL, and to let you get acquainted with Lys and Marshall, who just recently took office. All members and interested guests are invited to attend.

SWAP FEST

The Royal Gorge Ham Club will hold a Swapfest Sunday August 23 at 1:00 p.m. in the Surplus Sales parking lot in Canon City. Location is Hwy. 50 and Greydene. Talk in on 22/82. Tables \$3 per person, \$5 for shared tables. Your ticket or plates will get free admission to the Royal Gorge. Come join in the fun.

GIVE AWAY: Boat Anchor — Berkeley Freq. counter, 1MHz — w/10 meg & 100 meg prescaler. Call WØTAQ, Dave 471-2532, 598-19000 X2365.

FOR SALE: Model 15 Teletype in good workin condition; homebrew T/U unit. M.B. "Lamp" Lamp, WØCUS 684-9749.

FOR SALE: Like new DGM Morse, RTTY/ASCII, equipment as advertised in June '81 QST. MKB-2000 keyboard; MVD-1000 Demod; RF transformer for direct attachment to any TV as read-out. New cost over \$800.00 — will sell for \$680.00. Carl L. Smith, WØBWJ, 1070 Locust St., Denver, 80220. Telephone 1-322-1030.

FOR SALE: Clegg FM-27B 30 watt synthesized 2 meters — \$175.00. Hallicrafters HT-37 — 80-10 meter 100 watt transmitter — \$120.00. Hallicrafters HT-45 — 80-10 meter KW Amp — \$150.00. Bob KØDJ, 574-0488 after 7 p.m.



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